

**RELIABILITY DATA
MATTE TIN LEAD FINISH
3/29/2004**

• OPERATING LIFE TEST

PACKAGE TYPE	SAMPLE SIZE	OLDEST DATE CODE	NEWEST DATE CODE	K DEVICE HOURS ⁽¹⁾ AT +125°C	NUMBER OF ⁽²⁾ FAILURES
PDIP	77 77	0133	0133	77.00 77.00	0 0

• J-STD-020 PRECONDITIONING (168 HOURS 85°C/85%RH, 3X IR REFLOW +255°C)

PACKAGE TYPE	SAMPLE SIZE	OLDEST DATE CODE	NEWEST DATE CODE	K DEVICE HOURS 85/85	NUMBER OF FAILURES
8 LEAD MSOP	1,320	0107	0317	221.76	0
10 LEAD MSOP-E	798	0316	0316	134.06	0
8 LEAD PDIP	1,496	0132	0317	251.33	0
16 LEAD PDIP	562	0133	0205	94.42	0
8 LEAD SOIC	1,145	0205	0317	192.36	0
16 LEAD SOIC	281	0205	0205	47.21	0
18 LEAD SOIC-W	993	0317	0317	166.82	0
16 LEAD SSOP	562	0110	0202	94.42	0
28 LEAD SSOP	791	0317	0317	132.89	0
3 LEAD SOT-223	281	0205	0205	47.21	0
5 LEAD TSOT-23	632	0319	0319	106.18	0
6 LEAD TSOT-23	281	0205	0205	47.21	0
3 LEAD DD-PACK	450	0303	0332	75.60	0
5 LEAD DD-PACK	693	0318	0318	116.42	0
7 LEAD DD-PACK	300	0303	0303	50.40	0
	10,585			1,778.28	0

• HAST AT +131°C/85%RH WITH BIAS (AFTER JEDEC PRECONDITIONING)

PACKAGE TYPE	SAMPLE SIZE	OLDEST DATE CODE	NEWEST DATE CODE	K DEVICE HOURS AT +85°C ⁽⁴⁾	NUMBER OF FAILURES
16 LEAD SSOP	97 97	0110	0110	354.64 354.64	0 0

• WHISKER GROWTH TEST (1008 HOURS 85°C/85%RH)

PACKAGE TYPE	SAMPLE SIZE	OLDEST DATE CODE	NEWEST DATE CODE		NUMBER OF FAILURES
8 LEAD MSOP	20	0107	0107		0
16 LEAD SSOP	20 40	0110	0202		0 0

• PRESSURE COOKER TEST AT 15 PSIG, +121°C (AFTER JEDEC PRECONDITIONING)

PACKAGE TYPE	SAMPLE SIZE	OLDEST DATE CODE	NEWEST DATE CODE	K DEVICE HOURS	NUMBER OF FAILURES
8 LEAD MSOP	381	0107	0107	128.02	0
10 LEAD MSOP-E	218	0316	0316	73.25	0
8 LEAD PDIP	449	0132	0317	29.57	0
16 LEAD PDIP	154	0133	0205	27.72	0
8 LEAD SOIC	281	0205	0317	94.42	0
16 LEAD SOIC	77	0205	0205	1.85	0
18 LEAD SOIC-W	231	0317	0317	5.54	0
16 LEAD SSOP	154	0110	0202	44.02	0
28 LEAD SSOP	179	0317	0317	48.22	0
3 LEAD SOT-223	77	0205	0205	25.87	0
5 LEAD TSOT-23	155	0319	0319	52.08	0
6 LEAD TSOT-23	77	0205	0205	1.85	0
3 LEAD DD-PACK	150	0303	0332	3.60	0
5 LEAD DD-PACK	226	0318	0318	5.42	0
7 LEAD DD-PACK	100	0303	0303	2.40	0
	2,909			532.39	0

(1) Assumes Activation Energy = 1.0 Electron Volts

(2) Failure Rate Equivalent to +55C, 60% Confidence Level = 23.8 FIT

(3) Mean Time Between Failures in Years = 4,787

(4) Assumes 20X Acceleration from 85°C to +131°C

Note: 1 FIT = 1 Failure in One Billion Hours.

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• TEMP CYCLE FROM -65°C to +150°C (AFTER JEDEC PRECONDITIONING)

PACKAGE TYPE	SAMPLE SIZE	OLDEST DATE CODE	NEWEST DATE CODE	K DEVICE CYCLES	NUMBER OF FAILURES
8 LEAD MSOP	407	0107	0317	327.00	0
8 LEAD MSOP-E	222	0316	0316	222.00	0
8 LEAD PDIP	448	0132	0317	448.00	0
16 LEAD PDIP	152	0133	0205	152.00	0
8 LEAD SOIC	281	0205	0317	281.00	0
16 LEAD SOIC	77	0205	0205	77.00	0
18 LEAD SOIC-W	230	0317	0317	230.00	0
16 LEAD SSOP	154	0110	0202	154.00	0
28 LEAD SSOP	210	0317	0317	210.00	0
3 LEAD SOT-223	77	0205	0205	77.00	0
5 LEAD TSOT-23	154	0319	0319	154.00	0
6 LEAD TSOT-23	75	0205	0205	75.00	0
3 LEAD DD-PACK	150	0303	0332	15.00	0
5 LEAD DD-PACK	231	0110	0318	231.00	0
7 LEAD DD-PACK	100	0303	0303	10.00	0
	2,868			2,653.00	0

• THERMAL SHOCK FROM -65°C to +150°C (AFTER JEDEC PRECONDITIONING)

PACKAGE TYPE	SAMPLE SIZE	OLDEST DATE CODE	NEWEST DATE CODE	K DEVICE CYCLES	NUMBER OF FAILURES
8 LEAD MSOP	407	0107	0317	327.00	0
8 LEAD MSOP-E	222	0316	0316	222.00	0
8 LEAD PDIP	231	0132	0205	231.00	0
16 LEAD PDIP	154	0133	0205	84.70	0
8 LEAD SOIC	281	0205	0317	281.00	0
16 LEAD SOIC	77	0205	0205	77.00	0
18 LEAD SOIC-W	231	0317	0317	231.00	0
16 LEAD SSOP	154	0110	0202	154.00	0
28 LEAD SSOP	209	0317	0317	209.00	0
3 LEAD SOT-223	77	0205	0205	77.00	0
5 LEAD TSOT-23	155	0319	0319	155.00	0
6 LEAD TSOT-23	73	0205	0205	73.00	0
3 LEAD DD-PACK	150	0303	0332	15.00	0
5 LEAD DD-PACK	231	0110	0318	231.00	0
7 LEAD DD-PACK	100	0303	0303	10.00	0
	2,271			2,121.70	0

• BAKE +175°C

PACKAGE TYPE	SAMPLE SIZE	OLDEST DATE CODE	NEWEST DATE CODE	K DEVICE HOURS	NUMBER OF FAILURES
8 LEAD MSOP	197	0107	0317	172.50	0
8 LEAD MSOP-E	150	0316	0316	75.00	0
8 LEAD PDIP	188	0132	0317	188.00	0
16 LEAD PDIP	50	0133	0205	50.00	0
8 LEAD SOIC	199	0205	0317	199.00	0
16 LEAD SOIC	41	0205	0205	41.00	0
18 LEAD SOIC-W	150	0317	0317	150.00	0
16 LEAD SSOP	126	0110	0202	101.50	0
28 LEAD SSOP	150	0317	0317	150.00	0
3 LEAD SOT-223	50	0205	0205	50.00	0
5 LEAD TSOT-23	111	0319	0319	111.00	0
6 LEAD TSOT-23	49	0205	0205	49.00	0
5 LEAD DD-PACK	145	0318	0318	145.00	0
	1,606			1,482.00	0

• SOLDERABILITY (POST 8 TO 64 HOURS STEAM AGE OR 4 HOURS BAKE +155°C HEAT TREATMENT)

PACKAGE TYPE	SAMPLE SIZE	OLDEST DATE CODE	NEWEST DATE CODE	NUMBER OF LEADS	NUMBER OF FAILURES
3 LEAD DD-PACK	75	0303	0332	225	0
5 LEAD DD-PACK	108	0318	0318	540	0
7 LEAD DD-PACK	25	0303	0303	175	0
5 LEAD SOT-23	31	0314	0314	155	0
6 LEAD SC70	270	0251	0251	1,620	0
8 LEAD MSOP	161	0107	0314	1,288	0
8 LEAD PDIP	33	0314	0314	264	0
8 LEAD SOIC	33	0314	0314	264	0
16 LEAD SOIC	100	0205	0205	1,600	0
18 LEAD SOIC	33	0314	0314	594	0
16 LEAD SSOP	95	0110	0202	1,520	0
28 LEAD SSOP	33	0314	0314	924	0
16 LEAD TSSOP	10	0335	0335	160	0
8 LEAD 3 X 3 DFN	135	0320	0320	1,080	0
32 LEAD 5 X 5 QFN	135	0320	0328	4,320	0
	1,277			14,729	0

• SOLDER SHOCK (3 HOURS PCT + 1X SOLDER IMMERSION +245°C)

PACKAGE TYPE	SAMPLE SIZE	OLDEST DATE CODE	NEWEST DATE CODE	NUMBER OF FAILURES
8 LEAD MSOP	50	0107	0107	0
16 LEAD SOIC	50	0205	0205	0
16 LEAD SSOP	50	0110	0202	0
	150			0

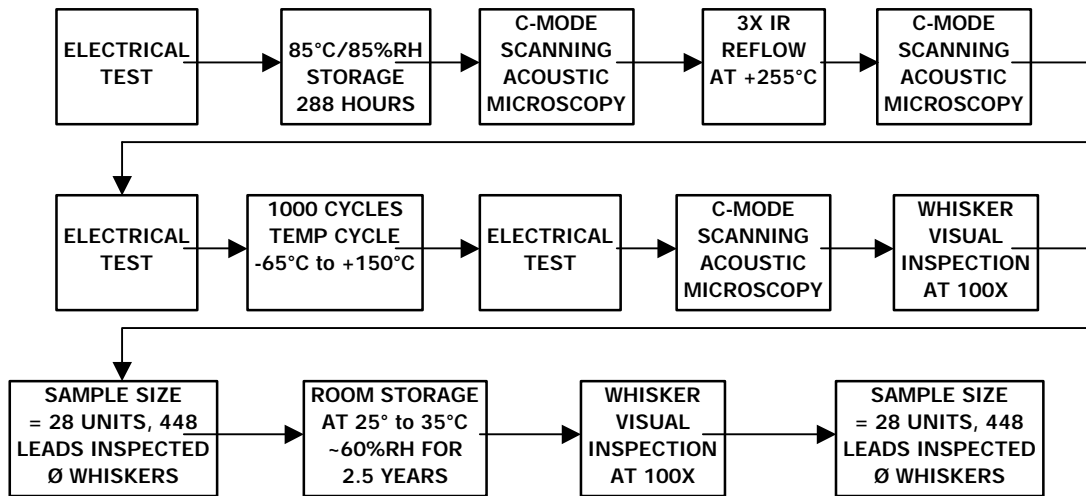
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• SPECIAL WHISKER GROWTH TEST (JEDEC PRECONDITIONING, TEMP CYCLE, ROOM AGE)

PACKAGE TYPE	SAMPLE SIZE	OLDEST DATE CODE	NEWEST DATE CODE	K DEVICE CYCLES	NUMBER OF FAILURES
LT1081CSW	28 28	0017	0017	28.00 28.00	0 0

• TEST FLOW FOR RESULTS ABOVE



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• PACKAGE LEVEL WHISKER GROWTH TEST +50°C / 60%RH

PACKAGE TYPE	SAMPLE SIZE	MONTHS ON TEST	NUMBER OF WHISKER GROWTH FAILURES
5 LEAD SC70	50	28	0
5 LEAD SC70	50	23	0
5 LEAD SC70	50	12	0
5 LEAD SC70	50	3	0
5 LEAD SOT-23	50	28	0
5 LEAD SOT-23	50	23	0
5 LEAD SOT-23	50	12	0
5 LEAD SOT-23	50	3	0
8 LEAD MSOP	50	28	0
8 LEAD MSOP	50	23	0
8 LEAD MSOP	50	12	0
8 LEAD MSOP	50	3	0
8 LEAD SOIC	44	54	0
20 LEAD SOIC	420	26	0
16 LEAD PDIP	240	54	0
16 LEAD QFN	160	6	0
16 LEAD SSOP	50	28	0
16 LEAD SSOP	50	23	0
16 LEAD SSOP	50	12	0
16 LEAD SSOP	50	3	0
5 LEAD DD-PACK	150	7	0
	1,814		0

• PCB LEVEL WHISKER GROWTH TEST +50°C / 60%RH USING VARIOUS SOLDER PASTES

PACKAGE TYPE	SAMPLE SIZE	MONTHS ON TEST	NUMBER OF WHISKER GROWTH FAILURES
16 LEAD SOIC - SnAg	32	42	0
5 LEAD SC70 - SnCu	32	42	0
5 LEAD SC70 - SnAgCu	32	42	0
	96		0

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• QUALITY TESTING

TEST PERFORMED	SAMPLE SIZE	PASS / FAIL CRITERIA	NUMBER OF FAILURES
CARBON CONTENT	4	<500 ppm	0
IONIC CONTAMINATION	12	<6.5 µg/in ²	0
SOLDER CRACK	200	NO CRACKS	0
THICKNESS CAPABILITY	160	Cpk = 2.12	0
EDXA	4	Sn PEAKS ONLY	0
MORPHOLOGY (GRAIN SIZE)	8	4 to 5 µm Grain Size	0
IR REFLOW, +260°C	88	NO CRACKS	0
	476		0

• RELIABILITY TESTS (TEMP CYCLE & AUTOCLAVE) WHISKER INSPECTION

TEST CONDITION	SAMPLE SIZE	PASS / FAIL CRITERIA	NUMBER OF FAILURES
-65°C to +150°C, 1K CYCLES	180	NO WHISKERS	0
-40°C to +90°C, 500 CYCLES	180	NO WHISKERS	0
-40°C to +125°C, 500 CYCLES	180	NO WHISKERS	0
+121°C / 100%RH, 1008 HOURS	180	NO WHISKERS	0
	720		0

• SOLDERABILITY TEST

TEST CONDITION	SAMPLE SIZE	PASS / FAIL CRITERIA	NUMBER OF FAILURES
Ø HOURS	40	100%	0
125°C 24 HOURS	40	100%	0
125°C 48 HOURS	40	100%	0
8 HRS STEAM + 24 HRS +100°C	40	100%	0
8 HRS STEAM + 24 HRS +100°C	40	100%	0
	200		0

• PLATING VISUAL APPEARANCE (30X INSPECTION)

TEST CONDITION	SAMPLE SIZE	PASS / FAIL CRITERIA	NUMBER OF FAILURES
Ø HOURS BAKE	500	100%	0
125°C 24 HOURS	500	100%	0
125°C 48 HOURS	500	100%	0
125°C 64 HOURS	500	100%	0
	2,000		0



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• RELIABILITY MONITOR TESTING - SOLDERABILITY

MONITOR PERIOD	SAMPLE SIZE	TEST CONDITION	NUMBER OF FAILURES
October-03	23	NO STEAM AGE	0
	32	8 HRS STEAM AGE	0
November-03	22	NO STEAM AGE	0
	29	8 HRS STEAM AGE	0
December-03	23	NO STEAM AGE	0
	21	8 HRS STEAM AGE	0
	150		0

• RELIABILITY MONITOR TESTING - TIN PLATING THICKNESS

MONITOR PERIOD	Cpk VALUE	TEST CONDITION	NUMBER OF FAILURES
October-03	>2.0	Cpk	0
November-03	>2.0	Cpk	0
December-03	>2.0	Cpk	0